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science in ACTION

INNOVATIVE RESEARCH FOR A SUSTAINABLE FUTURE

Test & Evaluation Facility

Cincinnati, OH



Introduction

The Test and Evaluation Facility (T&E) in Cincinnati, Ohio, is a versatile high bay facility for the research and development of new technologies related to water and waste monitoring, treatment, and control systems. T&E allows scientists to study drinking water contaminants, biosensors, and small systems, and verify water security monitoring and treatment technologies. Research at T&E provides the scientific foundation to support EPA's programs in drinking water, wastewater, and water systems security and resilience. This research has contributed to the development and use of technologies and strategies for monitoring and controlling water contaminants resulting from natural and man-made incidents. Research is performed under three of EPA's six National Research Programs:

- Safe and Sustainable Water Resources
- Homeland Security
- Sustainable and Healthy Communities

Facility and Staff

Facility: Located at Cincinnati Metropolitan Sewer District's Mill Creek Wastewater Treatment Plant (WWTP), T&E has a 24,000 ft² high bay area for bench-, pilot-, and full-scale research; 14,000 ft² of supporting office, chemical storage and analytical lab spaces; a greenhouse; and a machine shop.

Staff: Eight federal employees, 14 contractors, and several students and post-docs perform research at T&E.

Unique Facility Features

- The facility's proximity to the WWTP enables researchers to conduct real-time experiments on various wastewater streams.
- T&E is part of the Water Environment & Reuse Foundation's FAST Water Network (Facilities Accelerating Science & Technology), which connects researchers and new technology providers with test facilities to accelerate the adoption of innovative technologies.
- The facility is available for private and public sector collaborators, including:
 - other government agencies via interagency agreements and
 - academic institutions and private clients via a third-party contract or a Cooperative Research and Development Agreement under the Federal Technology Transfer Act Amendment.



The T&E Facility's High Bay Experimental Area.

T&E Capabilities

The T&E Facility has large, versatile spaces allowing for a variety of experimental configurations. This multi-purpose facility is equipped to simultaneously study a variety of wastewater and drinking water treatment processes and systems, and to study innovative hazardous waste treatment technologies utilizing the Resource Conservation and Recovery Act (RCRA) treatability study exemption. Facility features include:

- heated high bay experimental area with 35-ft ceiling;
- two 5-ton bridge cranes for moving large equipment;
- full-scale hydrant and telemetry system;
- wastewater and chlorinated, dechlorinated, recycled, and deionized water supplies to 16 experimental work areas;
- holding tanks with leak monitoring and alarm capability, including an automatic supply and drainage shutdown system;
- fully climate-controlled biosafety level 2, process, organic, instrument, and chemistry laboratories;
- machine shop (700 ft²) for fabricating specialty items;
- greenhouse (275 ft²) for agricultural studies, and
- two 12 x 12 ft controlled environmental chambers for simulating outdoor conditions.

Science Contributions

T&E's unique capability for bench- and large pilot-scale research is a critical link to EPA's ability to design and fabricate innovative solutions – tested in a safe environment without public health risk – and apply them to real-world challenges. Research at T&E provides water and wastewater systems operators with tested tools and technologies that can be scaled up at treatment plants and in water distribution systems.

Active research topics include:

- Drinking water and wastewater simulations to understand decontamination and persistence of contaminants in treatment and distribution systems.
- Real-time remote and smart water quantity/quality sensors for treatment and distribution systems.
- Innovative membrane materials and membrane-based processes for desalination and organic solvent reclamation/reuse.
- Emergency mobile treatment systems to provide potable water to residents and responders following disasters.
- Treatment of contaminated water for disposal resulting from wide-area decontamination activities following a natural disaster or intentional event.
- Source water early warning monitoring and detection technology.
- Contaminant persistence and performance of disinfection and flushing methods in aircraft water systems.
- Alternative wastewater treatment and decontamination approaches, including peracetic acid and ultraviolet technologies.

Notable scientific products and achievements include:

- Improved the ability of water utilities to detect contamination and better protect public health by:
 - testing commercial, off-the-shelf water quality sensors used to monitor water utility operations;
 - developing technologies for decontamination of drinking water and wastewater systems, and
 - designing, developing, and evaluating:
 - small community drinking water treatment and sensor systems,
 - technologies for removal of *Cryptosporidium*, *B. globigii*, and algal toxins in water, and
 - aquatic organisms as early warning indicators of harmful algal blooms in source waters.
- Completed performance evaluations of point-of-entry and point-of-use devices for removal of microbiological contaminants from tap water.
- Developed energy efficient processes to recover solvents and alcohol biofuels from dilute solutions.
- Verified EPANET, a water distribution system modeling software, via T&E's pilot-scale distribution system.

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